CHAPTER 4: WORK PLAN RATIONALE

Data needed to fully understand existing ecological resources should be defined and included in the rationale section of the ecological work plan. The rationale section should also explain and justify the approach to be taken in collecting ecological data. The following aspects of the approach should be included when applicable:

- Reference areas — Reference areas are generally uncontaminated and serve as a basis for comparison with the contaminated ecological habitat at the CERCLA site. Reference areas could be useful for certain streams or rivers and for terrestrial ecosystems where the contaminants are "point sources" in their spatial distribution. Reference areas can provide information on species composition and variation that is useful in setting revegetation and other reclamation goals for remediated sites.

- Ecological **field surveys** — Surveys of biotic communities will be used to characterize the biota and habitats both on- and off-site. Surveys of reference areas and contaminated areas should be conducted with the same techniques and at the same level of detail to ensure valid comparisons of data.

- **Surrogate species for laboratory tests** — Use of surrogate species tests is important when the receptor species have not been studied relative to the contaminants being evaluated or when species are precluded from study due to regulatory protection (e.g., bald eagle>. Use of taxonomically similar species for laboratory tests will provide useful information on the potential for bioaccumulation and/or chronic and lethal effects to individual organisms on site.

- In situ testing — Tests of an organism's responses to contaminants can be conducted with techniques such as exposing a receptor species in confined areas affected by contaminants (e.g., caged areas downstream of a point source in a stream), monitoring animal habitat use in the immediate vicinity of the contaminants, or conducting vegetation trials on contaminated soils of varying concentration. In-situ testing has disadvantages relative to controlling environmental variables but is advantageous in the sense that test organisms are exposed to contaminants in a more natural or "typical" environment.

- Toxicity tests — Toxicity tests are generally conducted in the laboratory and are used to determine adverse effects on individual organisms in terms of exposure to varying concentrations of a single or multiple contaminants under controlled conditions.

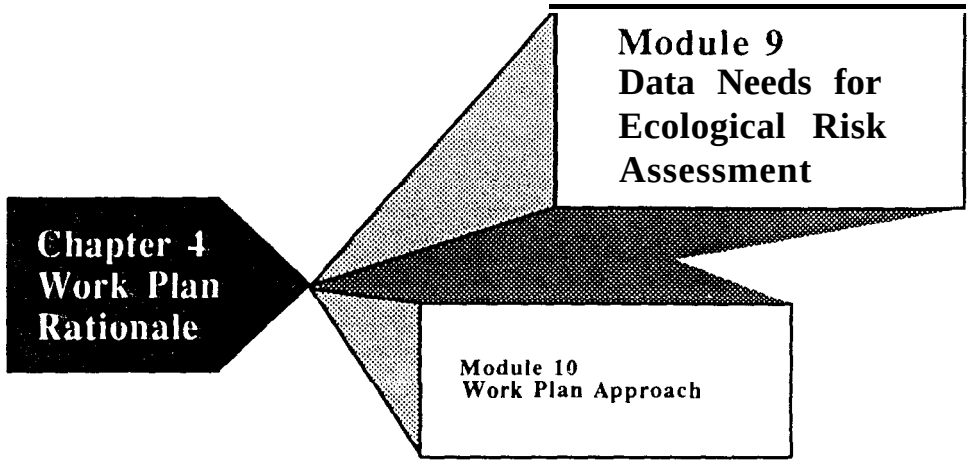
Module 9 describes steps to be followed in determining detailed ecological data needed for the site and adjacent areas affected by hazardous substance releases. While state and federally protected species are of concern in defining data needs and defining receptor species, other important species should be given equal consideration in planning the field sampling activities. An ecological risk assessment would be warranted, for example, if dominant or common species representing the base of the food web were adversely affected by hazardous substances being released.

To avoid possible duplication of effort in ecological field sampling, development of the ecological work plan should consider data also being collected in standardized task 3, Field Investigations of the RI/FS Work Plan. Studies may be defined in this task that are designed to provide a preliminary understanding of site-specific fate and transport mechanisms. The results of these studies may then be used to more accurately characterize site contamination.

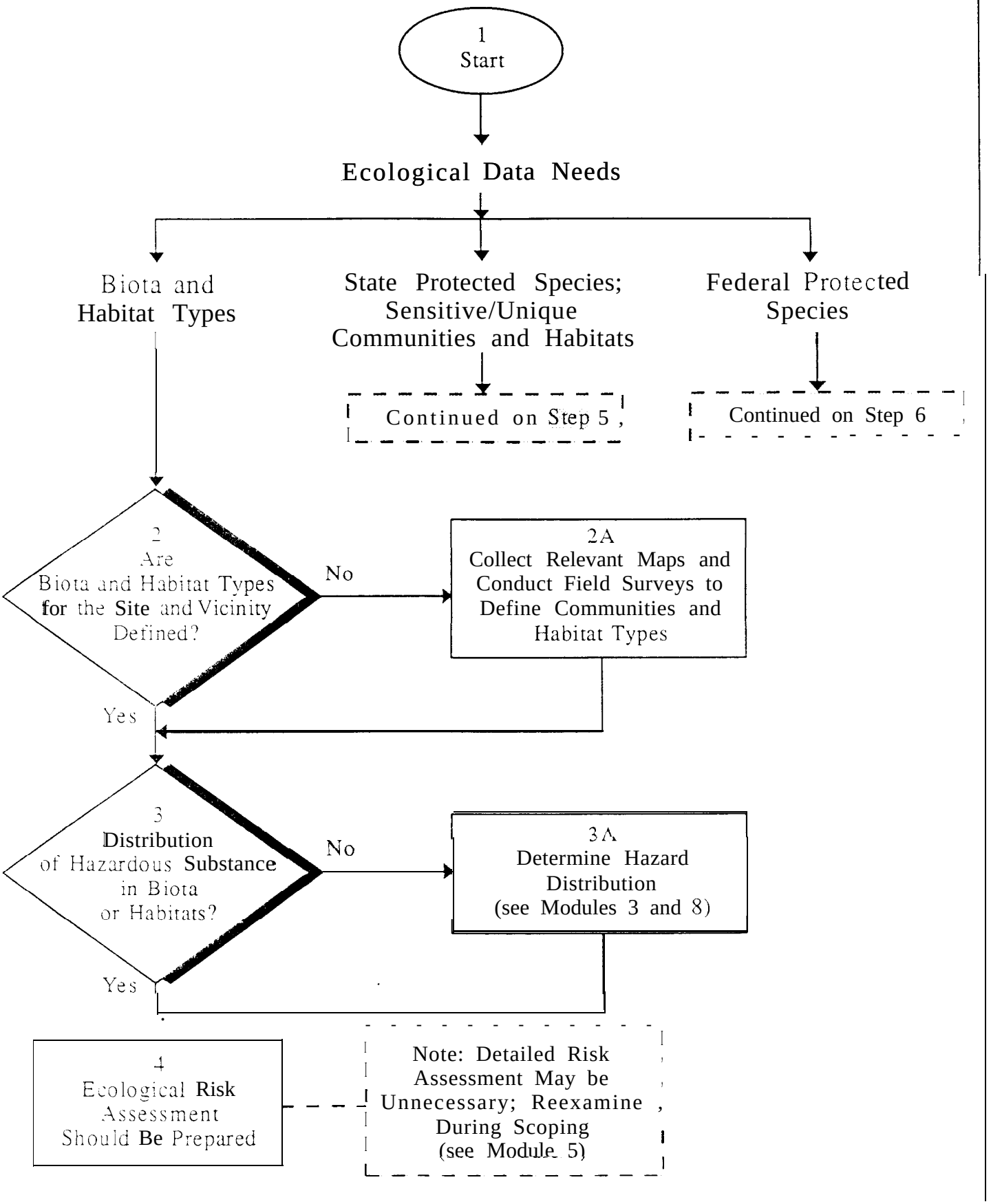
Ecological work plans are usually separate documents from the RI/FS Work Plan. Where numerous ecological concerns occur, particularly at a complex site, the ecological work plan should be a "stand-alone" document.

MODULE 9:

DATA NEEDS FOR ECOLOGICAL RISK ASSESSMENT



Module 9: Data Needs for Ecological Risk Assessment



MODULE 9: DATA NEEDS FOR ECOLOGICAL RISK ASSESSMENT

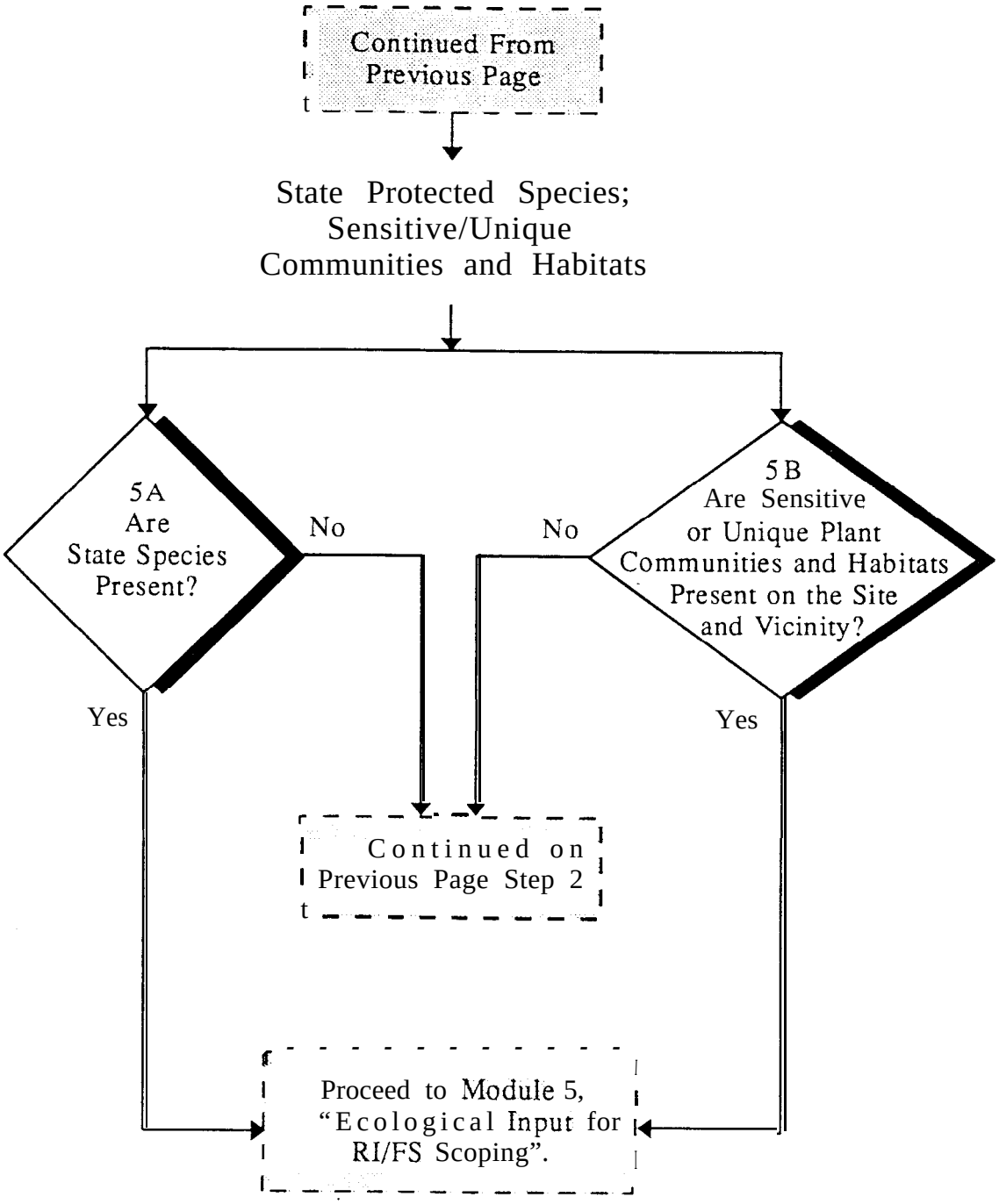
Step 1 Start.

Step 2, 2a An inventory of site ecological data should be compiled. This information will allow a determination of data adequacy (e.g., species studies and abundance of data by season or year) before proceeding with subsequent assessment tasks. Plant communities should be defined on a site map relative to known locations of hazardous substances. Qualitative and quantitative descriptions should be prepared. Typical information needed to characterize communities on-site and in the site vicinity include species lists by community type, percent cover, diversity indices (where appropriate), production data on important species, and population dynamics of various wildlife species (see **Appendix A, Sections A.4.1.1 and k4.1.3).**

Step 3, 3a Known locations of hazardous substances should be identified with respect to important biota and habitat types. If inadequate data exist, additional studies may be warranted to determine hazard distribution **(Appendix A, Sections k1.2 and k1.3).**

Step 4 If the site is devoid of vegetation, which is typical of an industrialized site, and provides essentially no habitat for wildlife where the hazardous substance occurs or to where it could migrate without remediation in the future, a detailed ecological risk assessment may be unnecessary. A final decision on the need for a detailed ecological risk assessment should not be made until scoping has been completed and interactions have occurred between DOE and agencies with legal responsibility for ecological resources.

Module 9: Data Needs for Ecological Risk Assessment

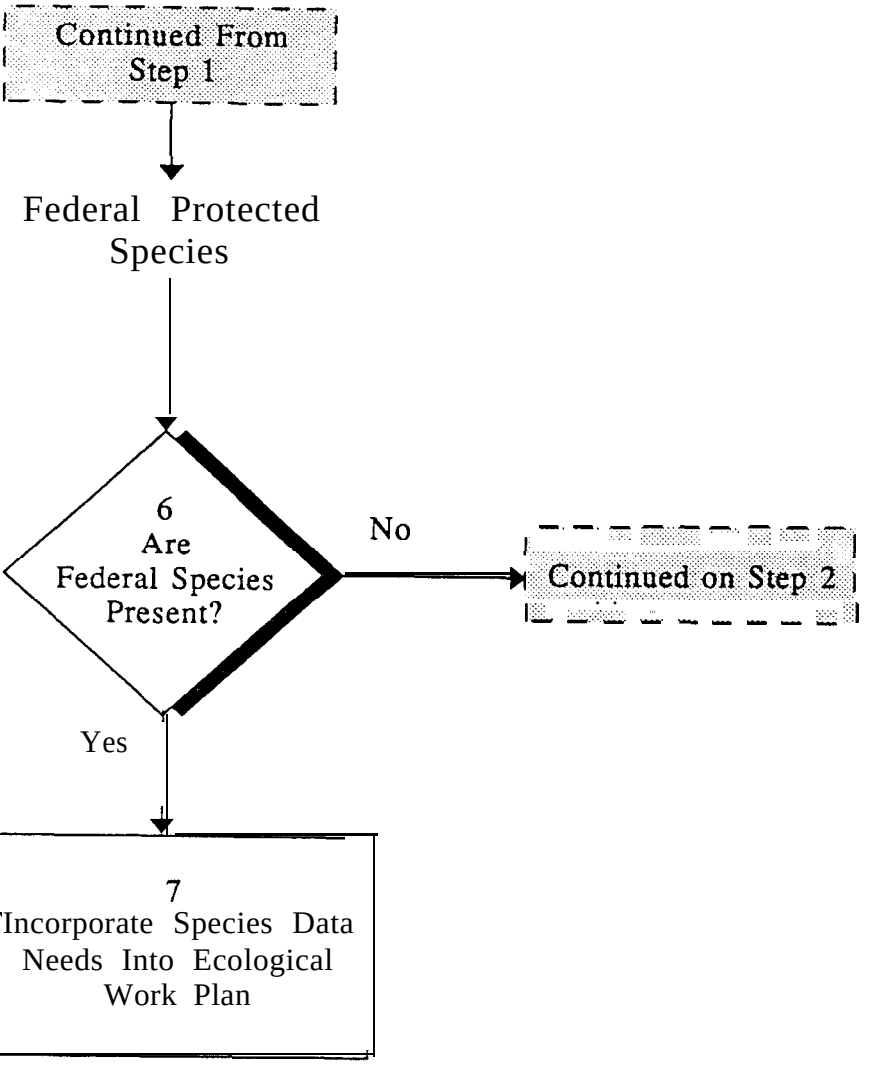


Step 5a, 5b Qualitative and quantitative descriptions should be prepared and spatial distribution data collected for sensitive/unique plant communities or habitats on the site **(see Appendix A, Section k1.3)** and in adjacent communities likely to be adversely affected by the hazardous substances in question. The appropriate state environmental or natural resource agency (e.g., Department of Conservation) can provide information on state-listed threatened and endangered species. Sensitive plant communities are often afforded protection by states. The occurrence or characterization of valuable communities or habitats may be difficult to determine on the basis of available information.

Sensitive environments require special attention at a particular site. These environments include (1) those associated with federal or state laws (e.g., wetland, critical habitats for listed species); (2) unique or unusual habitats (e.g., prairie remnants, springs); (3) those necessary for continued propagation of a key species (e.g., essential food, nesting, spawning or rearing sites) (EPA 1989c).

In determining ecological data needs for the RI/FS, the DOE ERPM and project ecologist should use, as guidance, a listing of sensitive environments defined by the EPA **(see Appendix D).** The presence of these sensitive environments along the migration pathways from the contaminated site was used as a criterion in evaluating the site originally for inclusion on the EPA's NPL.

Making a professional judgment that an existing plant community or habitat type is valuable may be a controversial point between ecologists and engineers or planners faced with decisions on developing remediation alternatives. Habitat importance will be site-specific and will depend upon such factors as (1) the species native to an area and their significance, (2) the availability and quality of substitute habitats, (3) surrounding land use and management, and (4) the value (e.g., economic, recreational or aesthetic) placed on such habitats by local residents or special interest groups (EPA 1989c).


Continued From Step 1
Federal Protected Species
6
Are Federal Species Present?
No
Continued on Step 2
Yes
7
Incorporate Species Data Needs Into Ecological Work Plan

Step 6 The FWS and appropriate state environmental or natural resource agencies can provide preliminary information on federally listed threatened and endangered species and/or designated critical habitats of the site area.

Step 7 If federally protected species are present, the ERPM should determine what data would be required to conduct an ecological risk assessment and incorporate such needs into the ecological work plan. The Endangered Species Act of 1973, as amended, requires a federal agency to prepare a. document called a biological assessment if the Secretary of Interior determines that federally protected species are believed to occur in the area potentially affected by the CERCLA site. A biological assessment would be prepared as part of the ecological data analysis for comparison of remedial action alternatives (see Module 16). The biological assessment would examine effects to federally protected species not only for each remedial action alternative, but also for the no-action alternative. All alternatives will be addressed in the FS. The biological assessment will be submitted to EPA along with the project FS reports.

The following discussion covers ecological data needs for federally protected species and gives an overview of FWS and DOE responsibilities in evaluating impacts. The discussion is included here rather than in Module 16 to inform the ERPM, project ecologists, and other users of the typical data needs and review process to be expected.

The Endangered Species Act requires the preparation of a biological assessment if federally endangered or threatened species inhabit or visit the CERCLA site or are located in areas adjacent to the site likely to be impacted by hazardous substances released at the site. Candidate species (C2 designation) for federal listing should also be evaluated for inclusion in the biological assessment. Data needs should be identified and factored in the field sampling plans and laboratory testing procedures (see Modules 12 and 13). The project ecologists may need to provide additional information based on FWS review comments. If a species is rare, but not legally designated as either threatened or endangered, the ERPM will need to consult with local ecologists or other experts (e.g., appropriate BTAG members) to determine the importance of the species (EPA 1989c). The draft biological assessment must be submitted to the appropriate regional office of the FWS for review. The ERPM should ensure that ecological data collection and the literature database for federally listed species is adequate to support the biological assessment. The biological assessments can be submitted to the FWS for separate review or included with the RI/FS reports.

If the FWS decides that formal consultation is needed under Section 7 of the Endangered Species Act, DOE may then be requested to revise the biological assessment and submit it as a formal report. After review of the draft

biological assessment, the FWS determines whether formal consultation is necessary.

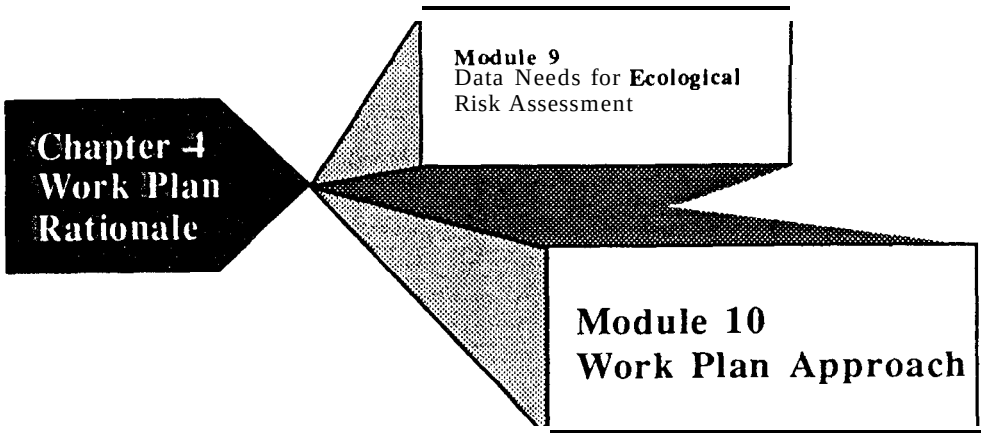
The FWS will prepare a *biological opinion* for the project based on consideration of the no-action case and various remediation alternatives under consideration. The biological opinion will conclude that the project will or will not lead to further decline of the species (i.e., a jeopardy or nonjeopardy opinion). The biological opinion considers both direct project effects on the species (i.e., death or detrimental health impacts to individual organisms) and habitat effects.

References

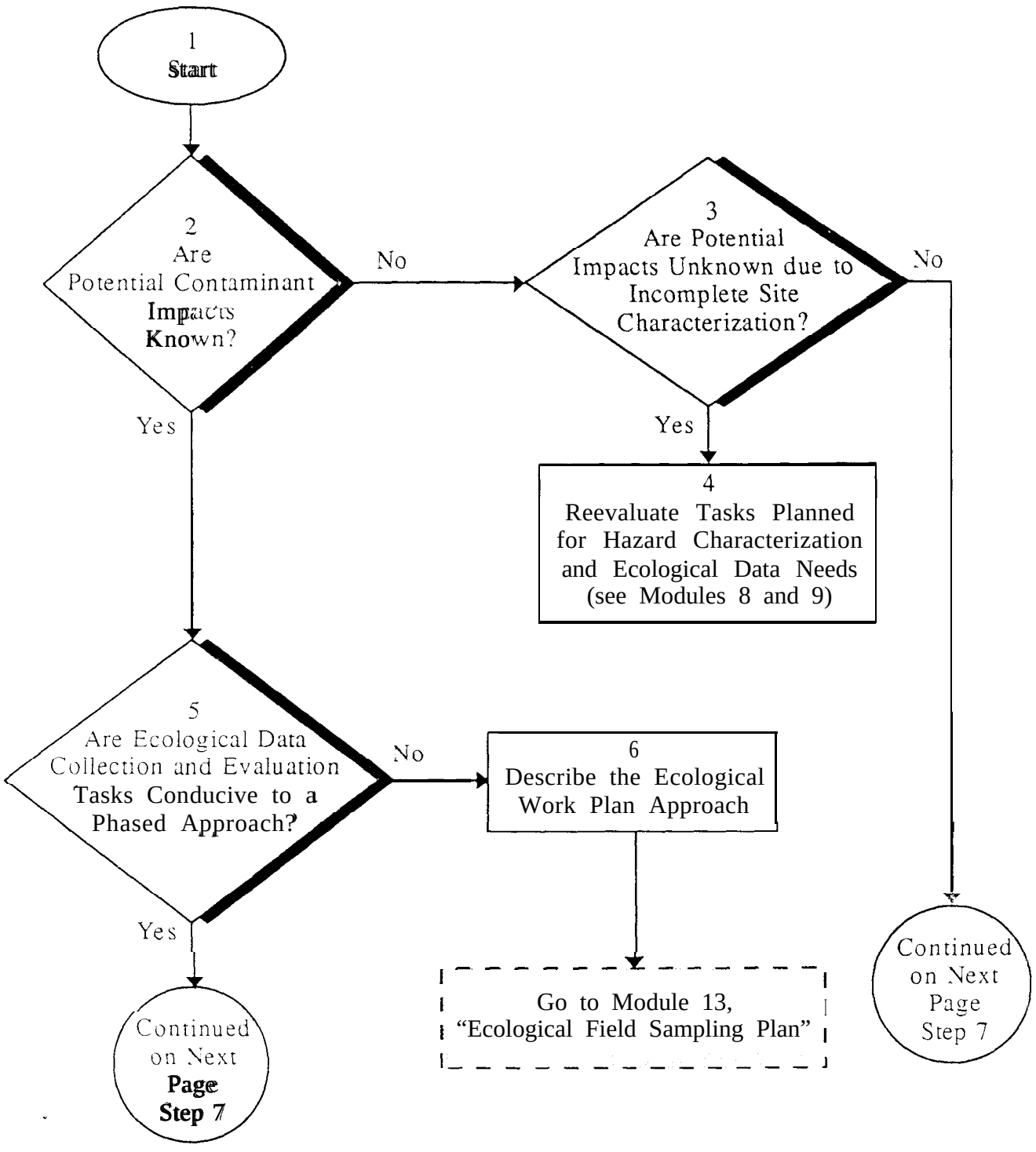
EPA, 1989c. *Risk Assessment Guidance for Superfund — Vol. II, Environmental Evaluation Manual,* report EPA/540/89/001, U.S. Environmental Protection Agency, Washington, D.C.

MODULE 10:

WORK PLAN APPROACH



Module 10: Work Plan Approach



MODULE 10: WORK PLAN APPROACH

Step 1 Start.

step 2 Potential ecological impacts can be determined from the initial evaluation of the hazardous substance, its chemical state, and spatial distribution (Chapter 3 and Module 6). In the event that potential impacts are unknown, then consideration should be given to detailed laboratory testing.

Step 3 Potential ecological impacts may not be readily determined at the time the ecological work plan is developed because of an incomplete understanding of the hazardous substances present, their state, or spatial distribution with regard to target species or sensitive biotic communities.

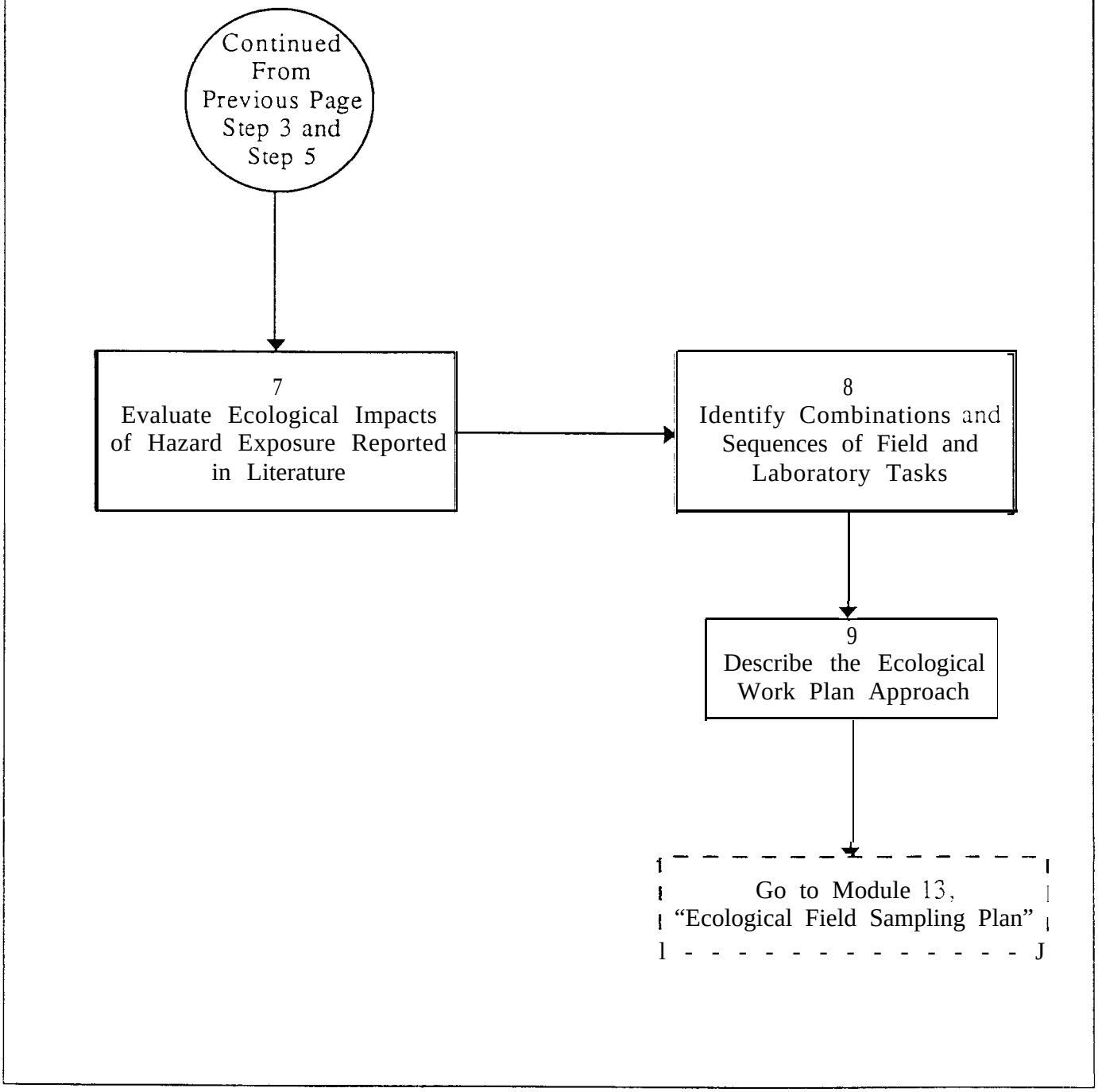
Data gaps are any significant uncertainties in the interconnections between the contaminant sources and releases, fate and transport, current nature (i.e., chemical state) and extent, and driving forces and pathways to ecological receptors. Data gaps will generally be revealed as uncertainties in the conceptual site model. The significance of each data gap will require evaluation as to whether the uncertainty is acceptable and manageable or whether additional data must be collected. Examples of data gaps include groundwater flow direction, location of waste units, and species composition of effected habitats.

Step 4 A reevaluation of tasks intended to more fully characterize the chemical contaminants may be necessary at the time the ecological work plan is prepared. The ecological field data needs can then be more accurately defined (see Modules 8 and 9).

Step 5 If potential ecological impacts are well known based on previous research, the ecologist must determine whether a phased approach to the ecological risk assessment process is warranted. Unless the hazardous waste is well characterized or the site is contaminated by a single chemical element or only one compound, a phased approach to ecological risk assessment is usually necessary. The phased approach avoids the cost and time required for a comprehensive analysis of all ecosystem components when information is needed only on a few target species (see **Appendix** A, **Section** A.4). The final phase of the ecological assessment process defmed in the work plan involves determining ecological risk combined with probabilistic modeling to evaluate uncertainty.

Step 6 The ecological work plan should contain a section describing the approach planned for the site in question **(see Appendix** A, **Section A.3)**. Detailed descriptions of sampling tasks and data evaluation procedures should be included in the ecological field sampling plan **(see Appendix B).** The work plan approach is the driver for defining the ecological field sampling plan tasks (see Module 13).

Module 10: Work Plan Approach



Step 7 Extrapolations can be made from scientific studies in defining the approach to be taken in the ecological risk assessment process. One important information source on known effects of environmental contaminants on fish and wildlife is a publication series prepared by the FWS. The EPA and DOE-HQ are currently developing ecotoxicology databases. The FWS has published several literature reviews on the effects of exposure of fish and wildlife to hazardous chemical elements and compounds (Eisler 1986, 1988a,b; Obenkirchen and Eisler 1988). A complete listing of review publications in the contaminant hazard review series can be obtained by contacting the Section of Information Management, U.S. Fish and Wildlife Service, Patuxent Wildlife Research Center, Laurel, Maryland, 20708.

Literature reviews can provide specific dose-response information for the species studied Dose-response information is useful in risk characterization or as the basis for further ecological effects studies. By comparing measured concentrations of contaminants in site media to literature values for adverse effects, investigators can decide whether there is a need to proceed with site-specific investigations (e.g., field studies or toxicity tests) (EPA 1991b).

Step 8 If little is known about the ecological impacts of exposure to the chemical contaminants in question, laboratory testing of representative or surrogate species should be used to determine the types and sequence of additional field sampling and laboratory toxicity testing. Field data collection and laboratory analyses may require a sequential approach to narrow the number of species for detailed analyses **(see Appendix A, Section A.3 and Figure A.2**). Laboratory testing of species may be necessary to determine which contaminants at the site are causing the most serious impacts. Tissue analyses can be used to determine potential effects on a number of important animal species present on the site or site vicinity before detailed exposure studies are undertaken on a select set of target species **(see Appendix A, Section A.4.1.4).** Data correlating body burdens with adverse effects are limited, however, for most wildlife species.

Step 9 The ecological work plan should contain a section describing the approach planned for the site in question **(see Appendix A, Section** A.3). Detailed descriptions of sampling tasks and data evaluation procedures should be included in the ecological field sampling plan **bee Appendix B).**

References

Eisler, R., 1986. *Polychlorinated Biphenyl Hazards to Fish, Wildlife, and Invertebrates: A Synoptic Review,* USFWS Biological Report 85(1.7), U.S. Fish and Wildlife Service, Washington, D.C., pp. l-72.

Eisler, R., 1988a. *Arsenic Hazards to Fish, Wildlife, and Invertebrates: A Synoptic Review,* USFWS Biological Report 85(1.12), U.S. Fish and Wildlife Service, Washington, D.C., pp. 1-92.

Eisler, R., 1988b. *Lead Hazards to Fish, Wildlife, and Invertebrates: A Synoptic Review,* USFWS Biological Report 85(1.14), U.S. Fish and Wildlife Service, Washington, D.C., pp. 1-134.

EPA, 1991b. *ECO Update, Ecological Assessment of Superfund Sites: An Overview,* U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Intermittent Bulletin 1(2):1-8, Washington, D.C.

Obenkirchen, E.W., and R. Eisler, 1988. *Chlorpyrifos Hazards to Fish, Wildlife, and Invertebrates: A Synoptic Review,* USFWS Biological Report 85(1.13), U.S. Fish and Wildlife Service, Washington, D.C., pp. 1-34.